CLAIMS

1. A system for measuring thermal distributions of an electronic device during operation, comprising:

a heat sink adapted to be coupled with an electronic device so as to be in thermal communication with the electronic device;

an electrical -insulating layer disposed between the electronic device and the heat sink; and

a plurality of thermal sensors located adjacent to the electrical-insulating layer, each of the plurality of thermal sensors in a different location, wherein the plurality of thermal sensors are located within one or more thin film circuit layers disposed on the electrical-insulating layer.

2. The system of claim 1, further comprising:

a module for receiving thermal information from the plurality of thermal sensors during operation of the electronic device, wherein the electronic device is operating under a range of operating conditions specified for the electronic device.

3. The system of claim 2, further comprising:

a processor coupled to the module for generating a thermal distribution of the electronic device based on the thermal information received from the plurality of thermal sensors.

4. The system of claim 3, wherein each of the plurality of thermal sensors is a thin film thermocouple.

5. The system of claim 4, wherein the plurality of thermal sensors comprises at least twenty five thin film thermocouples.

6. The system of claim 4, wherein each of the plurality of thermal sensors has a junction area of about 10,000 microns^2.

7. The system of claim 3, wherein the heat sink is any one of a copper element and a silicon element.

8. The system of claim 3, wherein each of the plurality of thermal sensors is a thin film resistor.

9. The system of claim 8, wherein the plurality of thermal sensors comprises at least twenty five thin film resistors.

10. The system of claim 8, wherein each of the plurality of thermal sensors has a junction area of about 10,000 microns^2.

11. The system of claim 8, wherein the heat sink is any one of a copper element and a silicon element.

12. The system of claim 3, wherein the electrical-insulating layer comprises a thin film of at least one of silicon nitride, silicon dioxide and alumina.

13. The system of claim 12, wherein the thin film of the electrical-insulating layer has a thickness of less than 1 micron.

14. The system of claim 3, wherein the plurality of thermal sensors comprise patterned films having a thickness from about 10 nm to about 5 microns.

15. The system of claim 4, wherein thermal impedance of the plurality of thermal sensors is governed by the heat sink.

16. A method for measuring thermal distributions of an electronic device during operation, the method comprising:

sensing, by a plurality of thermal sensors, thermal information of an electronic device during operation of the electronic device, the plurality of thermal sensors located adjacent to an electrical-insulating layer, each of the plurality of thermal sensors in a different location, wherein the plurality of thermal sensors are located within one or more thin film circuit layers and wherein the electrical-insulating layer is disposed between the electronic device and the heat sink.

17. The method of claim 16, further comprising:

receiving, by a module, thermal information from the plurality of thermal sensors during operation of the electronic device, wherein the electronic device is operating under a range of operating conditions specified for the electronic device.

18. The method of claim 17, further comprising:

generating a thermal distribution of the electronic device based on the thermal information received from the plurality of thermal sensors.

19. The method of claim 18, wherein each of the plurality of thermal sensors is any one of a thin film thermocouple and a thin film resistor.

20. The method of claim 18, wherein the plurality of thermal sensors comprise patterned films having a thickness from about 10 nm to 5 microns.

21. A system for measuring thermal distributions of an electronic device during operation, comprising:

an electronic device

a heat sink in thermal communication with the electronic device;

an electrical-insulating layer disposed between the electronic device and the heat sink; and

a plurality of thermal sensors located adjacent to the electrical-insulating layer, each of the plurality of thermal sensors in a different location, wherein the plurality of thermal sensors are located within one or more thin film circuit layers disposed adjacent to insulating-insulating layer.